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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/932,943	08/21/2001	Gaku Minamihaba	04329.2622	5394

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EXAMINER
LEE, HSIEN MING

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 11/08/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/932,943	MINAMIHABA ET AL.
	Examiner	Art Unit
	Hsien-Ming Lee	2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 October 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) *1-17* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *18-25* is/are rejected.

7)☒ Claim(s) *22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 August 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *5* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Applicant's election of claims 18-25 in Paper No. 7 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Specification

2. The abstract of the disclosure is objected to because the content is not directed to elected claims 18-25, which are method claims. Correction is required. See MPEP § 608.01(b).

Claim Objections

3. Claim 22 is objected to because of the following informalities: at lines 11-12, "a wiring material film and laminated on" should be -- a wiring material film laminated on --. Appropriate correction is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 18-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wojtczak et al. (US 6,409,781) in view of Towery et al. (US 6,464,740).

With respect to claims 18, 23 and 24, Wojtczak et al. in Figs. 1-3 and related text teach a method of manufacturing a semiconductor device, which comprises:

- forming a wiring groove on a surface of an insulating film 12 (a low dielectric constant film) formed above a semiconductor substrate 11;
- depositing a conductive material film, including a conductive barrier film 13 and a wiring material film 14, on a surface of said insulating film 12 including an inner surface of said wiring groove (Fig.1); and
- subjecting said conductive material film 13 and 14 to a chemical mechanical polishing by using a two-step slurry approach, comprising a first colloidal particles (i.e. first slurry) whose primary particles have a diameter ranging from 3 to 100 nm (col.5, lines 66-67) and a second colloidal particles (i.e. second slurry) whose primary particles have a diameter ranging from 3 to 100 nm as well (col.5, lines 66-67), wherein the particle range of the second slurry can be optimized and different from the first slurry, dependent upon the removal rate requirement of the conductive material film (col.8, lines 62-66), to remove the conductive material film 13 and 14 excluding a conductive material film portion which is buried in the wiring groove (Fig.2-3).

Wojtczak et al. do not teach subjecting said conductive material film 13 and 14 to a chemical mechanical polishing (CMP) by using either a slurry containing polishing particles comprising colloidal particles whose primary particles have a diameter ranging from 5 to 30 nm, wherein the degree of association of the primary particles is 5 or less, or a slurry containing polishing particles comprising first colloidal particles whose primary particles have a diameter ranging from 5 to 20 nm, and second colloidal particles which are made of the same material as that of the first colloidal particles and whose primary particles have a diameter larger than 20 nm,

wherein the weight ratio of the first colloidal particles is in the range of 0.6 to 0.9 based on a total weight of said first and second colloidal particles.

However, Towery et al. in a generic example of chemical mechanical polishing (CMP) process teach utilizing a bi-modal particle approach for removing conductive material film, comprising: subjecting the conductive material film (e.g. a metal feature 36) to the CMP by a slurry containing polishing particles comprising first colloidal particles whose primary particles have a diameter ranging from 5 to 45 nm, and second colloidal particles which are made of the same material as that of the first colloidal particles and whose primary particles have a diameter larger than 20 nm (i.e. larger than 40 nm), wherein the weight ratio of the first colloidal particles is in the range of 0.9 based on a total weight of said first and second colloidal particles (col.14, lines 2-21).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the CMP process of Wojtczak et al. by substituting the two-step slurry approach of Wojtczak et al. with the bi-modal particle approach of Towery et al. since by this substitution it would simplify the CMP process and provide a higher grinding rate and better surface finish for the conductive material film and the insulating film (col.14, lines 15-21).

With respect to claims 19-21 and 25, the combined teachings of Wojtczak et al. and Towery et al. teaches all claimed limitations, i.e. the conductive material film 14 is a wiring material film, which is a copper film; and the conductive material film is a laminate film composed of two layers 13 and 14 comprising a conductive barrier film 13 made of at least one kind of materials selected from the group consisting of TiN, WN, Ta, and TaN (col. 3, lines 45-49) and a wiring material film 14 (a copper film; col.3, line 49) laminated on the conductive

barrier film 13; wherein the wiring material film 13 and 14 are subjected to the CMP by using the slurry.

With respect to claim 22, the combined teachings of Wojtczak et al. and Towery et al. also teaches all claimed limitations, i.e. the conductive material film is a laminate film composed of two layers 13 and 14 comprising a conductive barrier film 13 made of at least one kind of materials selected from the group consisting of TiN, WN, Ta, and TaN (col. 3, lines 45-49) and a wiring material film 14 (a copper film; col.3, line 49) laminated on the conductive barrier film 13; wherein the wiring material film 13 and 14 are subjected to the CMP by using the slurry, which includes third particles formed of a material different from those of the first and second colloidal particles, to remove said conductive material film excluding a conductive material film portion which is buried in said wiring groove. Specifically, Towery et al. teach that the slurry particles can be formed from more of the following oxides and group of oxides: Al_2O_3, CeO_2, Sb_2O_5, ZrO_2 etc.; and the slurry particles are not necessary one hundred percent pure and can also purposely be formed from a combination of the oxides (col. 14, lines 46-52), which inherently teaches the claimed third particles formed of a material different from those of the first and second colloidal particles.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-Ming Lee whose telephone number is 703-305-7341. The examiner can normally be reached on M-F (9:00 ~ 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the

organization where this application or proceeding is assigned are 703-305-0142 for regular communications and 703-305-0142 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Hsien Ming Lee
November 7, 2002